2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

25aC-1

September 25th (Fri.), <10:00-12:00>
Room 3

Effect of ozone applying method on removing floating weeds

○Yoshihiro KAWADA*, Keiko OSHIDA** and Hirotaka SHIMIZU*

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Abstract:

Colonies of floating weeds are grown over at the stagnant water area of a lake and a river. These often cause environmental issue. Therefore, it is needed for maintain water environment to prevent growth for the floating weeds. The aim of this study is to control growth and death of floating weeds with ozone. The applying method of ozone to floating weeds is investigated. As results, when ozone is applied to the gas around floating weeds, floating weeds are dead effectively. To apply the water with ozone to the floating weeds is less effective than to apply to air around floating weeds. In case that the ozone generator is driven by solar array, the floating weeds having the leaves of approximately 5 times area as large as that of solar array could be dead.

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Effect of Swirling Liquid Flow on Plasma-based Water Treatment

○Shohei MATSUNARI, Shinichi AKAGAWA, Shuichi AKAMINE, Ryuta ICHIKI, Seiji KANAZAWA

Department of Electrical and Electronic Engineering, Oita University

Abstract:

Three-dimensional (3D) printing technology is now essential in making things, and we have introduced this technology into the design and fabrication of non-thermal plasma reactors. In this study, water injection part of the plasma reactor was prepared by a 3D printer. To produce swirling liquid flow in the running water along an inner wall of a cylindrical tube, a specific design was added into the injector. Three types of the injectors were prepared by the 3D printer and those performances were evaluated by the comparison of the decolorization rate of indigo carmine solution. As a result, the swirling liquid jet type injection was most effective method under our experiments for water treatment.

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Room 3

Influence of Pulse Width on Decomposition of Dichloromethane by Discharge Inside Bubbles in Water

○Masashi IWABUCHI*, Keita WADA*, Katsuyuki TAKAHASHI*, Koichi TAKAKI*, Naoya SATTA**

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Abstract:

Influence of pulse width on decomposition of dichloromethane by discharge inside bubbles in water has been investigated. The discharge reactor consists of a glass tube and a tungsten wire inserted into the glass tube, which is immersed in the water. Argon gas is injected into the glass tube to generate bubbles in the water.

Two types of pulsed generator, a magnetic pulse compression circuit and an inductive-energy storage system using semiconductor opening switch, are used to generate high voltage pulse with various pulse widths.

Dichloromethane (DCM) which is a volatile organic compound is employed as a specimen to evaluate decomposition efficiency. The DCM is decomposed successfully by discharge inside bubbles in water. TOC removal efficiency and DCM decomposition efficiency are similar in each pulse width. Energy efficiency for decomposition increases by decreasing the pulse width.

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Development and evaluation of pencil type solution plasma reactor

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Abstract:

Solution plasma (SP) is defined as; one type non-equilibrium, cold plasma in liquid. SP is different from other systems by avoiding inert gas usage, and generating inside solution environment. SP has been used for metal nanoparticles synthesis, surface modifications, organic-compound decompositions, and carbon materials synthesis. There are application limitations because of small plasma area inside solution. It is necessary to increase the plasma area in order to obtain higher efficiency from the process. In this study, we have developed a new reactor for continuous processing and continuous synthesis of the material. Non-equilibrium plasma was generated with two type of reactors (attached needle electrode and coil electrode or mesh electrode). Despite of two reactor usage, solution temperature didn't increase even after 30 min of discharge. It is observed that by decreasing electrodes distance, plasma is shifting from the end of needle electrode and generating between mesh and needle electrodes with a higher energy. We have succeeded in developing a new reactor, which can generate plasma continuously.

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Effect of irradiation distance of plasma jet on ROS supply to liquid bottom.

○Shota KUSUMEGI, Akihiro KUDO, Takuya TSURUMARU, Tomohiro SAKANOSHITA, Akihiro SATO, Yasutaka WAKABAYASHI, Toshiyuki KAWASAKI

Nippon Bunri Univ.

Abstract:

The supply of reactive oxygen species (ROS) to a target through liquid byplasma jet should be clarified. However, the etailed mechanisms are not clear now. Therefore, the ROS generation in liquid by the plasma jet has been studied by various measurement methods. In this study, the use of a gel reagent with iodine-starch reactions has been focused as a plasma-generated ROS detection method. The gel reagent can work even in water. In this paper, a plasma jet was irradiated onto the water surface, and the ROS reaching the water bottom were detected using the gel reagent set in the water. The plasma jet generator was made of a glass tube with wrapped powered and grounded electrodes. Helium gas with 1% oxygen was supplied into the glass tube at a flow rate of 3 L/min. The water layer with a thickness of 1 mm was placed onto the gel reagent. The irradiation distance was varied from 5 to 30 mm. As a result, the ROS supply to the water bottom by plasma jet was significantly influenced by the irradiation distance. The results obtained in this study also indicated that the ROS supply mechanisms were markedly different from the ozone exposure.

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Decomposition characteristic of olive oil and various fatty acids in oil-water mixture by pulsed discharge plasma and ozone treatments

○Takanori TANINO, Daiki KAWAI and Takayuki OHSHIMA

Graduated School of Science and Technology, Gunma University

Abstract:

Decomposition characteristic of olive oil in oil-water mixture by pulsed discharge plasma and ozone treatment was investigated. The decomposition profile of olive oil showed liner decrease for the initial

10 min treatment and became slower after that in the pulsed discharge plasma treatment. In ozone treatment, rapid decrease was observed for initial 5 min treatment. Solid substance was produced by both pulsed electric discharge and ozone treatment. Decomposition characteristics of several chain length fatty acids by both treatments were also investigated. As short and middle chain fatty acids, butyric and caprylic acids were used, respectively. These short and middle chain fatty acids were successfully decomposed by the pulsed discharge plasma treatment. On the other hand, ozone treatment could not decompose these fatty acids.

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Effect of Organic Acids on Cesium Removal from Contaminated Soil by the Electrokinetic Remediation

○Tomoaki MIURA*, Mahmudul KABIR*, Masafumi SUZUKI*, Shyunsuke NAKAJIMA**, Shigehisa MORI**

*Graduate School of Engineering and Resource Science, Akita University,
**Sanwa Tekki Corporation

Abstract:

Radioactive materials were scattered on the vast area near Fukushima, Japan after the Fukushima Atomic Power Plant accident after the earthquake occurred on the 11th March, 2011. Among the radioactive materials, especially Cesium (Cs) caused a severe contamination of soil and due to its longer half-life (30.0 years), the removal of Cesium is urgently needed. However, the removal of Cesium from soil especially in the mountainous area is not so easy. We have proposed a method of Cesium removal which can also be applied in the slope area. Non-radioactive Cesium was used in our experiments. During the Electrokinetic process of the contaminated soil, acetic acid and citric acid were applied in purpose of more Cesium removal. These acids are easily decomposable in nature. Without any electric field, a small range of Cesium removal was possible with tap water, and the two organic acids. Performing the experiment with Electrokinetic process, using acetic acid as electrolyte, showed a better result considering the amount of removal of Cesium. Thus, our Electrokinetic process has showed good results to remove Cesium from contaminated soil.